PYTHON FOR COMPUTATIONAL PROBLEM SOLVING

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Computer Science and Engineering

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Computer Hardware & Software

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PYTHON FOR COMPUTATIONAL PROBLEM SOLVING

Previous Class

Notion of Computational Problem Solving.

- Example: River Crossing Problem(MCGW)

PYTHON FOR COMPUTATIONAL PROBLEM SOLVING

Topics to be covered in this session

- Digital Computer
- Computer Hardware
- Operating System
- Computer Software
- Syntax, semantics and program translation

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Digital Computer

The Digital computer is the most commonly used type of computer and is used to process information with quantities using digits, usually using the binary number system.

Computer Hardware

Computer hardware comprises the physical part of a computer system. It includes :

- **central processing unit** (CPU) and **main memory**
- **peripheral components** such as a keyboard, monitor, mouse, and printer.

Computer Hardware

Central processing unit (CPU) – the "brain" of a computer system. Interprets and executes instructions.

Main memory – is where currently executing programs reside.It is volatile, the contents are lost when the power is turned off.

Computer Hardware

Secondary memory – provides long-term storage of programs and data. Non-volatile, the contents are retained when power is turned off. Can be magnetic (hard drive), optical (CD or DVD), or flash memory (USB drive).

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Computer Hardware

Computer Hardware

Input/output devices – mouse, keyboard, monitor, printer, etc.

Buses – is a communication system that transfers data between components inside a computer , or between computers.

- Internal Bus (System Bus: CPU and Main Memory)
-External Bus (Expansion Bus :printer to the computer)

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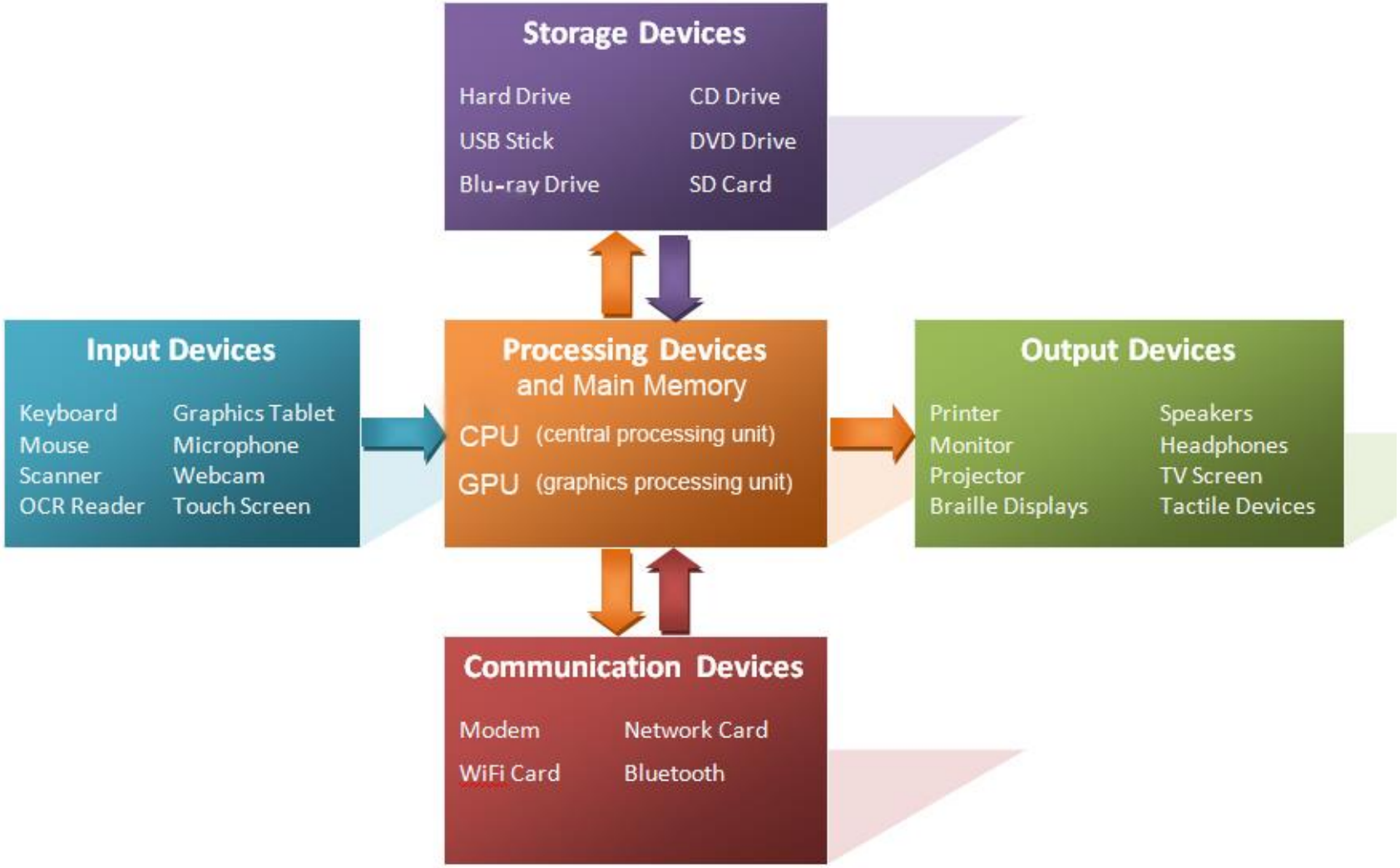
Computer Hardware

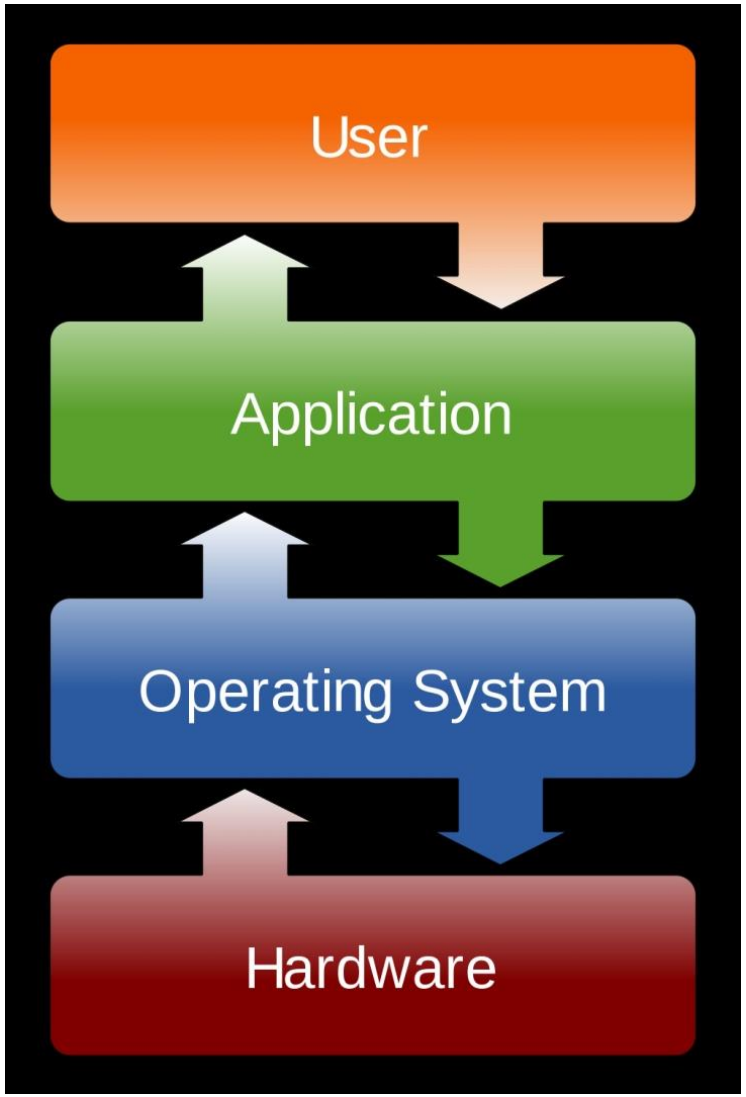


Operating System

An **operating system** is software that manages and interacts with the hardware resources of a computer.

Because an operating system is intrinsic to the operation of a computer, it is referred to as **system software**.

Operating System



Computer Software

Computer software is a set of program instructions, including related data and documentation, that can be executed by computer.

- **System software:** intrinsic to a computer system.
- **Application Software:** Application software is specific purpose software which is used by user for performing specific task.

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System Software vs Application Software

S.No.	System Software	Application Software
1.	System software is used for operating computer hardware.	Application software is used by user to perform specific task.
2.	System softwares are installed on the computer when operating system is installed.	Application softwares are installed according to user's requirements.

System Software vs Application Software

3.	In general, the user does not interact with system software because it works in the background.	In general, the user interacts with application softwares.
4.	System software can run independently. It provides platform for running application softwares.	Application software can't run independently. They can't run without the presence of system software.
5.	Some examples of system softwares are compiler, assembler, debugger, driver, etc.	Some examples of application softwares are word processor, web browser, media player, etc.

Syntax

English, for example, includes the letters of the alphabet, punctuation, and properly spelled words and properly punctuated sentences.

The **syntax** of a language is a set of characters and the acceptable sequences (arrangements) of those characters.

The following is a syntactically correct sentence in English,

“Hello there, how are you?”

The following, however, is not syntactically correct,

“Hello there, hao are you?”

Semantics

Consider the following sentence:

“how you hello are?”

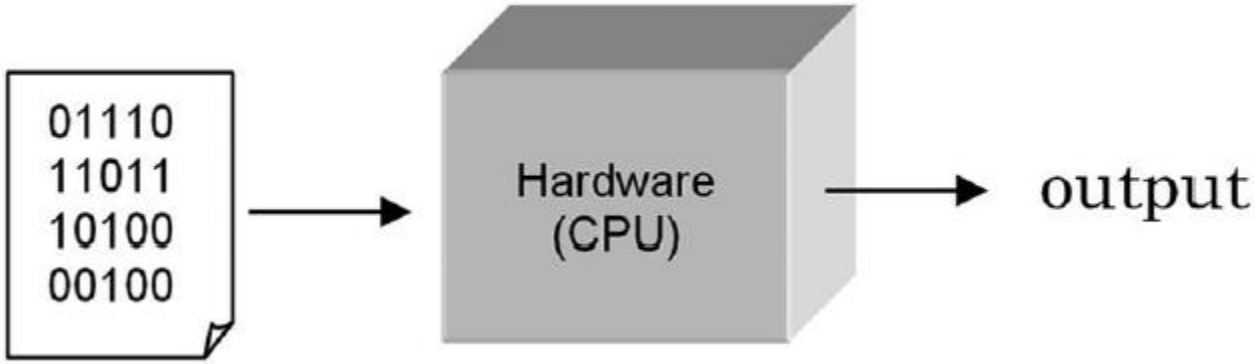
This sentence is syntactically correct, but has no meaning. Thus, it is *semantically incorrect.*

The **semantics** of a language is the meaning associated with each syntactically correct sequence of characters.

Every language has its own syntax and semantics.

Program Translation.

A central processing unit (CPU) is designed to interpret and execute a specific set of instructions represented in binary form (i.e., 1s and 0s) called **machine code**. Only programs in machine code can be executed by a CPU.



Program Translation.

Writing programs at this “low level” is tedious and error-prone.

Therefore, most programs are written in a “high-level” programming language such as Python.

Since the instructions of such programs are not in machine code that a CPU can execute, a translator program must be used.

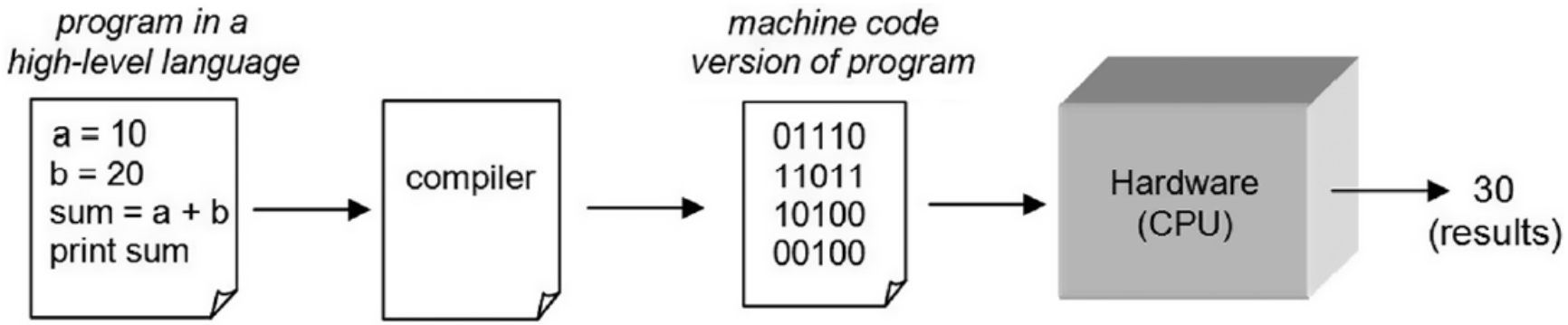
Program Translation.

There are two fundamental types of translators:

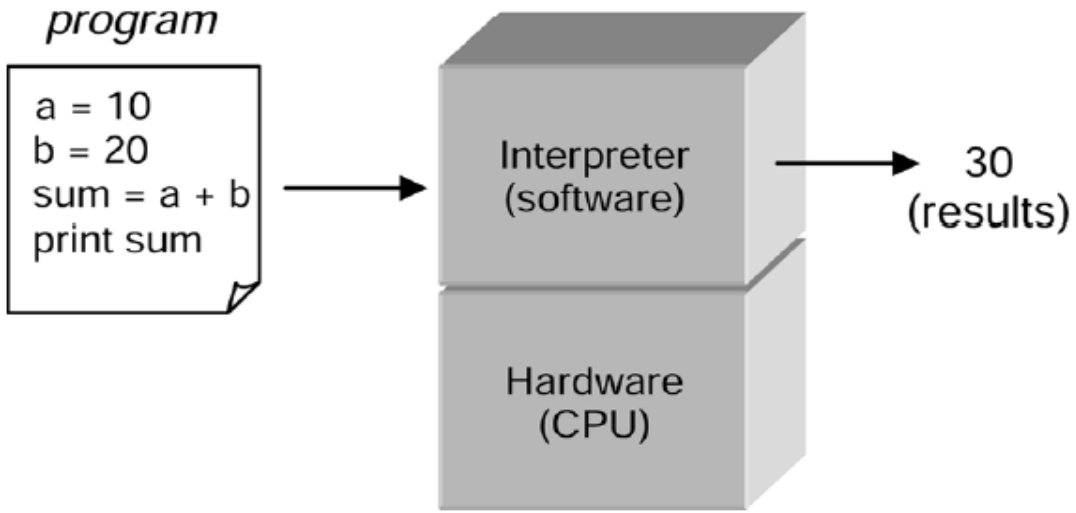
Compiler :translates programs into machine code to be executed by the CPU

Interpreter **:**executes instructions in place of the CPU

Compiler


program in a high-level language
a = 10
b = 20
sum = a + b
print sum
compiler
machine code version of program
01110
11011
10100
00100
Hardware (CPU)
30
(results)

Interpreter



An interpreter can immediately execute instructions as they are entered.
This is referred to as **interactive mode**.

THANK YOU

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